## REMARKS

Upon entry of the present Preliminary Amendment-C the claims in the application are claims 1-3, 5-9, and 12-20, of which claims 1, 3 and 17 are independent.

The specification and Figs. 2, 4, 7, 9, 11, 14, 17, 19 and 21 are amended to overcome the Examiner's objections set forth at items 1-4 of the Office Action. Specifically, Figs. 2, 4, 7, 9, 11, 14, 17, 19 and 21 are amended by replacing the letter-designated section lines with number-designated section lines pursuant to the Examiner's suggestion, while the specification is amended to have appropriate spacing between words, to be consistent with the amendments to the drawings, to include descriptions of all parts having reference numerals in the drawings, and to overcome minor informalities as noted by the Examiner.

Claim 1 is amended to more specifically define that the gas flow path portion extends continuously from the opening portion, the occupant restraint portion extends continuously from the gas flow path portion, and the gas flow path portion has at least one penetrating extending therethrough, claim 3 is amended to incorporate the features of claim 4 (now cancelled) and to further define that the gas flow path portion extends continuously from the opening portion, claims 1 and 3 are also amended to overcome the Examiner's objections to certain claim language at item 6 of the Office Action, new claim 16 further defines that the penetrating portion is sealed in a manner such that fluid communication between the inside of the air bag and ambient air outside the bag via the penetrating portion is substantially prevented, and new claims 17-18 define similar aspects of the invention as presented in amended claim 1 and claim 16.

Applicant respectfully submits that all of the above amendments are fully supported throughout the original application, including the drawings, and that the above amendments do not introduce any new matter into the application.

Applicant further respectfully submits that the above amendments to the claims and the cancellation of claims 10, 11 overcomes the Examiner's rejection of claims 1-15 Under 35 USC §112, second paragraph, and accordingly it is respectfully requested that the rejection be reconsidered and withdrawn.

Similarly, applicant respectfully submits that the above amendments to the specification and drawings overcome the Examiner's objections set forth at items 1-4 of the Office Action, and accordingly it is respectfully requested that the objections be reconsidered and withdrawn.

Art Based Rejections

1. In item 8 of the Office Action, the Examiner has rejected claims 1-2, 7 and 10-11 under 35 U.S.C. 102(e) as anticipated by Shiota et al. (US Patent 5,427,410). In item 12 of the Office Action, the Examiner also rejects claims 6 and 8-9 under 35 U.S.C. 103(a) as unpatentable over Shiota et al. It is the Examiner's position that Shiota teaches all the features of claims 1, 2, 7, 10 and 11, including joint portions at the interfaces of side openings 106, 107, and that it would be obvious to duplicate his cloth cavity 108 for multiple effect as an obvious design variant.

Applicant's Response

Upon careful consideration and in light of the above amendment to claim 1, applicant respectfully submits that the Examiner's rejections are overcome and that each of present claims 1, 2 and 6-9 is clearly patentably distinct over Shiota's air bag, based on the following.

Initially, applicant respectfully submits that Shiota's air bag does not include or make obvious an air bag including a penetrating portion extending through a gas flow path as now defined in amended claim 1. Particularly, claim 1 more specifically defines the location of the penetrating portion extending through the gas flow path portion that extends continuously from an opening portion of the air bag into which gas generated by the inflator flows. As shown in the drawings, for example in Figs. 1-3, the gas flow path portion 16 directly receives the gas from the inflator as the gas enters air bag , and the gas must pass through the portion 16 before it enters the (much larger) occupant restraint portion 17. As discussed in the application, the presence of the penetrating portion in the gas flow path portion reduces the area through which gas enters the air bag, and thereby it is possible to easily alter/control the rate at which gas from the inflator enters the air bag by selecting an appropriately sized/shaped penetrating portion . As explained, this is very advantageous because it permits a given inflator to be easily, properly and compatibly matched with different sized air bags required for different vehicle types.

Quite differently, Shiota teaches an air bag 10 including a cavity 20 extending from the left side to the right side in the large occupant restraint portion of the airbag, spaced from the gas flow path portion of the air bag where gas from the inflator enters the air bag, and also including a vent hole 24 formed in a wall of the cavity 20 so that inflating gas within the fully extended air bag may be vented to the outside through the cavity, especially when the air bag is engaged by a vehicle occupant (e.g., see Shiota's Fig. 6). The cavity is formed by a cylindrical cloth 108 which is sewn or otherwise attached to outer surfaces of the airbag panel to define opposite side openings 106, 107 that communicate with the outside. As discussed by Shiota, the disposition of the cavity within the occupant restraint portion of the air bag closer to the occupant rather than to the inflator, permits a lower portion of the air bag to extend earlier than an upper portion of the air bag. Thus, while the cavity 20 reduces the volume of gas needed to fill his air bag for permitting a smaller inflator to be used and/or permitting the air bag to be inflated more quickly, as noted by Shiota, the cavity does not permit the flow of gas entering into the air bag to be easily controlled, as does the claimed invention. Nor would it ever be obvious to modify Shiota's cavity 20 by placing same in the gas flow path portion of his air bag, as claimed, given Shiota's full disclosure of the cavity 20, including the vent hole 24, and its function.

Moreover, applicant respectfully submits that the above distinction is very significant because the claimed invention, again, permits a given inflator to be readily and easily compatible with various sized airbags by simply extending an appropriately sized/shaped penetrating portion in the gas flow path portion of the air bag, while the penetrating portion is desirable smaller and less involved than Shiota's cavity 20.

Further, applicant respectfully submits that Shiota's air bag does not include or make obvious features of the dependent claims more specifically defining the penetrating portion in relation to the gas flow path portion (which, again, is further defined relative to the air bag opening in claim 1). For example, given the disposition of the cavity 20 in the occupant restraint portion of Shiota's air bag, it does not divide his gas flow path portion into two or more flow paths for flowing the gas from the opening portion to the occupant restraint portion as defined in claim 2, nor does it reduce an opening area of the gas flow path portion as defined in claim 7, multiple penetrating portions as defined in claim 6 or multiple penetrating portions meeting the

additional limitations of claims 8-9.

In this regard, while the Examiner correctly points out that Column 4, lines 23-33 of Shiota teaches reducing the inertial volume of the air bag to shorten inflation time or ensure full inflation of the bag, with a fixed or reduced-capacity inflator, applicant again respectfully submits that such teaching does not render the subject matter of claims 6 or 8-9 obvious. Shiota fails to teach plural penetrating portions, does not teach penetrating portions extending through the gas flow path portion as defined, nor does Shiota teach dividing the gas flow path portion into multiple flow paths.

Based on the foregoing, the Examiner's rejections of claims 1, 2 and 6-9 based on the Shiota reference are believed to be overcome, and accordingly it is respectfully requested that the rejections be reconsidered and withdrawn.

2. In item 9 of the Office Action, the Examiner has rejected claims 3-5 and 12-15 under 35 U.S.C. 102(b) as anticipated by Maruyama (US Patent 5,593,179). It is the Examiner's position that the stitching 25 by which Maruyama's guide member 20 is attached to his air bag constitutes the claimed joint portions, and that the stitching (and guide member 20) divide the gas flow path portion of his air bag into two or more sections (flow paths). can be characterized as a joint portion, including Maruyama's guide portions 20, 20a, 28, 30. Maruyama discloses an air bag device including guide portions which guide gas flowing into the occupant restraint portion of the air bag to first enter upper and lower sections of the occupant restraint portion, after which the gas enters the large middle section of the occupant restraint portion.

Applicant's Response

Upon careful consideration and in light of the above amendment to claim 3, applicant respectfully submits that the Examiner's rejections are overcome and that each of present claims 3, 5, and 12-15 is clearly patentably distinct over Maruyama's air bag, based on the following.

Initially, applicant respectfully submits that Maruyama's guide member 20 is not disposed in a gas flow path portion *extending continuously from an opening portion* of the air bag dividing the gas flow path portion into two or more flow paths, as now required of the joint portion defined in claim 3. Rather, Maruyama's guide member 20, like Shiota's cavity 20, is spaced from the opening portion of his air bag and disposed within the large occupant restraint

portion of the air bag as shown and described. Again, applicant respectfully submits that this is an important distinction for reasons as discussed above.

Further, applicant respectfully submits that Maruyama's air bag does not include or make obvious features of the dependent claims more specifically defining multiple joint portions and the structure of the joint portion(s) in relation to the gas flow path portion (which, again, is further defined relative to the air bag opening in claim 3). For example, claim 5 defines that the joint portion involves partially sewing parts of the gas flow path portion of the air bag together. Again, the presence of such joint portion in the gas flow path portion reduces the area through which gas enters the air bag, and thereby it is possible to easily alter/control the rate at which gas from the inflator enters the air bag by selecting an appropriately sized/shaped penetrating portion. Conversely, the stitching 25 of Maruyama does not sew together portions of his air bag's gas flow path portion, but sew edges of his guide member 20 to different portions of the occupant restraint portion of his air bag. As shown, the guide member does not reduce the area through which gas enters Maruyama's air bag, but instead create paths in the occupant restraint portion so that outer sections of same are inflated sooner than a middle section of same.

Also, while the embodiment shown in Maruyama's Figs. 5-6 includes multiple guide members 28, 30, they are not the same (structurally or functionally) as the multiple joint portions as claimed in dependent claims 12-15, again, because they are not in a gas flow path portion *extending continuously from an opening portion* of the air bag dividing the gas flow path portion into two or more flow paths as claimed, nor do they reduce the opening area of the gas flow path portion as defined in claims 13-14.

Based on the foregoing, the Examiner's rejection of claims 3-5 and 12-15 based on the Maruyama reference is believed to be overcome, and accordingly it is respectfully requested that the rejection be reconsidered and withdrawn.

Other Matters

The additional references, Inoue et. Al., Fischer et al., and Japanese Patent 4-135940, cited by the Examiner at item 13 of the Office Action have been considered by applicant, but it is respectfully submitted that these additional references fail to overcome the deficiencies of the Shiota and Maruyama references discussed above in relation to the present claims.

New claims 16-18 are believed to be allowable over the references of record for those

reasons discussed above in relation to claims 1 and 3, as well as for the merits of the additional features recited in these new claims.

Conclusion

In conclusion, applicant has overcome the Examiner's objections and rejections as presented in the Office Action; and moreover, applicant has considered all of the references of record, and it is respectfully submitted that the invention as defined by each of the present claims is clearly patentably distinct thereover.

The application is now believed to be in condition for allowance, and a notice to this effect is earnestly solicited.

If the Examiner is not fully convinced of all of the claims now in the application, applicant respectfully requests that she telephonically contact applicant's undersigned representative to expeditiously resolve prosecution of the application.

Favorable reconsideration is respectfully requested.

Respectfully submitted,

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CERTIFICATE OF TRANSMISSION

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# AIR BAG SYSTEM

## BACKGROUND OF THE INVENTION

The present invention relates to an air bag system housed in an instrument panel in front of a front occupant seat of a vehicle. More particularly, the present invention relates to an air bag system dealing with air bags of which various sizes are required for different car types corresponding to a constant output of an inflator.

## DESCRIPTION OF THE RELATED ART

The air bag system is housed in a housing portion in a front instrument panel. The air bag is housed in a folding state in a retainer of the air bag system. High-pressure gas generated from an inflator is introduced into the air bag at the time of a collision of a vehicle, so that the air bag is inflated toward a front seat occupant for restraining the forward movement of the occupant due to inertia force.

In air bag systems, different sizes of air bags are required to be housed corresponding to different car types which individually require different restraining performances. It is true in the current situation that there is a big difference in sizes between car types.

Since an air bag is inflated with high-pressure gas generated from an inflator (a gas generating device), the sizes of the air bag are one of the factors to determine the output of the inflator. As the sizes of the air bag are expanded, the volume thereof is increased. The increasing volume leads to a requirement of an inflator having a higher output.

As a result, inflators having different outputs need to be prepared for air bags of different sizes and volumes, and therefore the compatibility of air bag systems of the related art among car types remains low.

## SUMMARY OF THE INVENTION

It is an object of the present invention to provide an air bag system ~~dealo with~~which can properly use various sizes of air bags corresponding to a constant output of ~~ana~~ given size inflator, which are required for different car types.

In view of the aforesaid problem, after earnest studies the ~~inventor and et al~~inventors have come to a conclusion that the problem may be solved by an air bag system including an air bag in a folded state housed in an instrumental panel, the air bag ~~inflated~~inflates by an inflator when a vehicle is crashed, wherein the air bag ~~comprising:~~comprises:

an opening portion into which a gas generated by the inflator ~~is flown;~~flows;

a gas flow path portion; and

an occupant restraint portion, wherein

the gas ~~is flown~~flows from the opening portion to the occupant restraint ~~portion,~~portion through the gas flow path portion.

Namely, the air bag system according to the present invention is characterized by providing at least one~~of the~~ penetrating portion~~s~~ in the air bag.

In addition, the air bag system according to the invention is characterized by provision of at least one~~of the~~ joint portion~~s~~ in the air bag.

Furthermore, it is possible to provide both the penetrating ~~portions~~portion(s) and the joint ~~portions.~~portion(s) in the air bag.

It is preferable to provide the penetrating portion and/or the joint portion in the gas flow path portion of the air bag to divide the gas flow portion into ~~at least one of the gas flow~~

~~portions.~~multiple gas flow paths. This allows only the volume of the gas flow path portion to be adjusted, while keeping restraining performance of the air bag.

The penetrating portion and/or the joint portion may be provided between the opening portion and the gas flow path portion of the air bag, whereby the gas flow path portion may be divided into ~~at least one of gas~~multiple gas flow paths. ~~flow path portions.~~

## BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a cross-sectional view of an instrument panel portion where an air bag according to the invention is housed;

Fig. 2 is a perspective view showing an air bag according to one embodiment of the present invention;

Fig. 3 is a cross-sectional view of the air bag taken along the line ~~A-A~~3-3 thereof in Fig. 2;

Fig. 4 is a perspective view showing an air bag according to another embodiment of the present invention;

Fig. 5 is a cross-sectional view of the air bag taken along the line ~~B-B~~5-5 in Fig. 4;

Fig. 6 is a perspective view showing a production process of the air bag shown in Fig. 4;

Fig. 7 is a perspective view showing an air bag according to a further embodiment of the present invention;

Fig. 8 is a cross-sectional view of the air bag taken along the line ~~C-C~~8-8 thereof in Fig. 7;

Fig. 9 is a perspective view showing an air bag according to an embodiment of the present invention.

Fig. 10 is a cross-sectional view of the air bag taken along the line ~~D-D~~10-10 thereof in Fig. 9;

Fig. 11 is a perspective view showing an air bag according to another embodiment of the present invention;

Fig. 12 is a cross-sectional view of the air bag taken

along the line ~~E-E~~12-12 thereof in Fig. 11;

Fig. 13 is a perspective view showing an air bag according to a further embodiment of the present invention;

Fig. 14 is a perspective view showing an air bag according to a further embodiment of the present invention;

Fig. 15 is a cross-sectional view of the air bag taken along the line ~~F-F~~15-15 thereof in Fig. 14;

~~Fig. 16 is a~~Figs. 16(a) and 16 (b) are cross-sectional ~~view of the air bag taken along the line F-F thereof in another form in Fig. 14;~~views similar to Fig. 15 showing a modification of the air bag in Fig. 14, in which Fig. 16(a) shows the air bag in a folded up state and Fig. 16(b) shows the air bag in an inflated state;

Fig. 17 is a perspective view showing an air bag according to another embodiment of the present invention;

Fig. 18 a cross-sectional view of the air bag taken along the line ~~G-G~~18-18 thereof in Fig. 17;

Fig. 19 is a perspective view showing an air bag according to a further embodiment of the present invention;

Fig. 20 is a cross-sectional view of the air bag taken along the line ~~H-H~~20-20 thereof in Fig. 19;

Fig. 21 is a perspective view of the air bag according to a further embodiment of the present invention;

Fig. 22 is a cross-sectional view of the air bag taken along the line ~~I-I~~22-22 thereof in Fig. 21; and

Fig. 23 is a cross-sectional view of the air bag taken along the line ~~I-I~~23-23 thereof in Fig. 21.

DETAILED DESCRIPTION OF THE PREFFRRED EMBODIMENTS

Fig. 1 is a cross-sectional view showing the deployed state of an air bag of one embodiment of an air bag system according to the present invention.

As shown in Fig. 1, the air bag system 1 is preferably housed at an upper portion in an instrument panel 11. The air bag system 1 comprises:

an airtight container-like retainer 12 which opens to an upper surface of the instrument panel 11; and

lids 13a and 13b which close an upper end opening of the retainer 12.

An inflator 14 and an air bag 15 are accommodated in the interior of the retainer 12. The interior of the retainer has an air bag housing portion. ~~An~~The inflator 14 is a container including a gas generating agent such as pyrotechnic material. When a collision is detected through deceleration of a vehicle, the gas generating agent is ignited and high-pressure gas is then gushed or rapidly expelled out. The air bag 15 is something like a bag which opens at one end thereof. The air bag 15 is joined airtight at the opening portion thereof to the retainer in such a manner that a gas generated from the inflator 14 flows in the air bag 15.

When the speed of the vehicle is drastically reduced due to a collision or the like, an acceleration sensor detects the deceleration of the vehicle to ignite the gas generating agent in the inflator 14. Then, high-pressure gas is gushed out and the air bag 15 is pressed against lower surfaces of the lids 13a and 13b. As a result, the lids 13a and 13b are then pushed up to rotate upwardly to thereby open the upper end opening of the retainer 12. Therefore, the air bag 15 is inflated through the opening.

The air bag 15 comprises the opening portion, a gas flow path portion 16 and an occupant restraint portion 17. The gas flow path portion 16 is a portion which substantially covers an upper surface of the instrument panel when the air bag is inflated.

The gas flowing out of the inflator 14 passes through the

gas flow path portion 16 of the air bag via a gas flow-in portion in the retainer 12 and flows into the occupant restraint portion 17.

The air bag 15 is made of an airtight and soft material such as a nylon woven fabric and is preferably formed into a bag-like configuration using polyamide threads. In addition, it is preferable to have rubber or silicone having heat resistance coated on an internal surface of the air bag 15.

According to the air bag system of the present invention, the volume of air bags may be maintained constant by providing ~~thea~~ penetrating portion or portions and/or ~~thea~~ joint portion or portions in predetermined sizes in the air bag. Due to this, ~~The~~the same size inflator may be used on different car types while maintaining the occupant restraining performance of the air bag.

It is preferable to provide the penetrating portion or portions and/or the joint portion or portions in the above gas flow path portion, whereby only the volume of the gas flow portion is~~allowed to be~~ adjusted and the maintenance of the occupant restraining performance can be eased.

An example will be described in which the gas flow path portion is penetrating partially into at least one of the flow paths by providing the penetrating portion in the gas flow path portion.

Fig. 2 is a perspective view showing a completely inflating state of an air bag having a penetrating portion. Fig. 3 is a cross-sectional view of the air bag taken along the line ~~A-A~~3-3 in Fig. 2.

The penetrating portion 21 may be formed, whereby a panel 22 join~~t~~s an opening hole in an upper panel of the gas flow path portion with a hole in a~~n~~ lower panel thereof. The panel 22 is a separate component extending along ports of the holes for the penetrating portion. The joining of the panel 22 can be

implemented using a suturing method, a thermal fusing method or a bonding method using an adhesive (reference numerals 23 and 24 denoting sutured portions).

The gas generated from the inflator passes through an opening 25, then ~~is penetrating~~flows into flow paths 26a and 26b which are situated on sides of the penetrating portion 21 in the gas flow path portion, and finally flows into the occupant restraint portion.

Furthermore, preferably vent holes ~~(vent holes)~~ are provided in an air bag for exhausting the gas.

In the air bag 2, as shown in Fig. 2, vent holes 27a and 27b are provided in both side panels thereof.

Fig. 4 is a perspective view showing a completely deployed state of an air bag 3 with a penetrating portion according to another example, and Fig. 5 is a cross-sectional view of the air bag 3 taken along the line ~~B-B~~5-5 in Fig. 4. In addition, Fig. 6 is a perspective view showing one ~~of processeo~~process for producing the air bag 3. A penetrating portion 31 can be formed by joining parts of upper and lower panels of a gas flow path portion in an oval fashion through suturing and then cutting out a joint portion 33 inside a sutured portion 32. Preferably polyamide threads are used for suturing. The gas generated from the inflator ~~is penetrating~~flows into flow paths 34a and 34b, which are situated on both sides of the penetrating portion in the gas flow path portion, and finally the gas flows into an occupant restraint portion of the air bag.

While there is no limitation to the configuration of the penetrating portion, a circular, oval, square or diamond shape may be preferred since the shapes can facilitate the formation of the penetrating portion.

In addition, the penetrating portion may be provided in an end portion of the gas flow path portion attached to the opening of the air bag. Fig. 7 is a perspective view showing a

completely inflating state of an air bag according to an example of the invention in which a penetrating portion 41 is provided at an end portion of the gas flow path portion attached to the opening of the air bag. Fig.~~7 is a perspective view showing a completely inflating state of an airbag according to an example in which a penetrating portion is provided at an end portion of the penetrating portion attached to the opening of the air bag. Fig.~~ 8 is a cross-sectional view of the air bag 4 taken along the line ~~c-c~~8-8 thereof in Fig. 7. In this case, the openings 45a and 45b of the air bag 4 are formed as a penetrating configuration. The gas passes through the openings 45a and 45b and flows into an occupant restraint portion via flow path portions 46a and 46b. In Figs. 7-8, 42 indicates a side face, 43 indicates front faces, and 44 indicates rear faces of the flow path portions. Vent holes are indicated at 47a, 47b.

Fig. 9 is a perspective view showing the completely inflating state of an air bag 5 according to another example of the invention in which a penetrating portion 51 is provided at the end portion of the opening portion. Fig. 10 is a cross-sectional view of the air bag shown in Fig. 9 taken along the line ~~D-D~~10-10 thereof. In this case, the openings 53a and 53b of the air bag are formed into a penetrating configuration. The gas passes through the openings 53a and 53b and flows into an occupant restraint portion via the flow paths 54a and 54b. In Figs. 9-10, 52 indicates a sutured portion, and 56a, 56b are vent holes.

A plurality of penetrating portions may be provided in the gas flow path portion using a method similar to those described heretofore. Fig. 11 is a perspective view showing a completely ~~inflating~~inflated state of an air bag of an example in which a plurality of penetrating portions are provided in a gas flow path portion. Fig. 12 is a cross-sectional view of the air bag 6 shown in Fig. 11 taken along the line ~~E-E. The gas is penetrating in~~12-12. The gas flows from a gas flow path

portion into flow paths situated on sides of a penetrating portion 61a. The flow path portion is further ~~penetrating~~penetrated at penetrating portions 61b and 61c into flow paths 63a, 63b and 63c and finally flows into the occupant restraint ~~portion.~~ portion. Joining panels are indicated at 62a, 62b, 62c, while vent holes are indicated at 64a, 64b.

Additionally, while the penetrating portion preferably pierces the gas flow path portion vertically, the penetrating portion may pierce the gas flow path portion transversely or a combination those vertical and transverse penetrating portions may be adopted.

Fig. 13 is a perspective view showing a completely ~~inflating~~inflated state of an air bag according to a further example of the invention in which penetrating portions are provided in such a manner as to pierce a gas flow path portion vertically and transversely. The penetrating portions of the air bag 7 can be formed by providing notches for vertical penetrating portions in upper and lower panels of the gas flow path portion from openings and suturing a panel 71 which is a separate component (and is provided with notches for transverse penetrating portions) along the notches as shown in Fig. 13 (reference numerals 72, 73, 74 and 75 denoting sutured portions). The opening of the air bag 7 is ~~penetrating~~formed into four openings 76a, 76b, 77a, 77b. Vent holes are indicated at 78a, 78b.

However, in case the penetrating portions are provided in such a manner as to start from openings of an air bag, the number and configuration of gas flow-in portions within a retainer should be made to coincide with those of the openings of the air bag.

Fig. 14 is a perspective view showing a completely deployed state of an air bag according to an example of the invention in which joint portions are provided, and Fig. 15 is a cross-sectional view of the air bag 8 shown in Fig. 14 taken long the line ~~F-F~~15-15 thereof. Joint portions 81 and 82 are

formed by linearly joining parts of upper and lower panels together at two locations in an air bag deployment direction. A suturing method, a thermal fusing method or a bonding method using an adhesive may be used as a method for joining the upper panel to the lower panel (reference numerals 81 and 82 denoting sutured or joint ~~portions),~~ portions). AS shown, three gas flow paths 84a, 84b, 84c are defined in the gas flow path by the joint portions 81, 82. A sutured portion is indicated at 83, and vent holes are indicated at 86a, 86b.

~~Fig. 16 shows~~Figs. 16(a) and 16(b) are cross-sectional views showing the cross section taken along the line ~~F-F~~15-15 of the air bag shown in Fig. 14 in another or modified form, in which Fig. ~~16A~~16(a) shows a cross-sectional view prior to deployment in a state in which the air bag is folded up, whereas Fig. ~~16B~~16(b) shows a completely deployed state of the air bag. As shown in Fig. ~~16A,~~16(a), the joint portions 81 and 82 are provided in such a manner that there is little sag at a lower surface of a portion constituting a central flow path 84b, and therefore, when deployed the flow path 84b becomes thinner than flow paths 84a and 84c.

The gas generated from the inflator ~~is penetrating~~flows into the three flow paths 84a, 84b and 84c before it flows into a occupant restraint portion.

Fig 17 is a perspective view showing a completely deployed state of an air bag according to another example of the invention in which a joint portion is provided, and Fig. 18 is a cross-sectional view of the air bag 9 shown in Fig. 17 taken along the line ~~G-G~~18-18 thereof. A joint portion 91 can be formed by joining parts of upper and lower panels in a gas flow path portion together in an oval fashion, whereby two flow paths 93a and 93b can be formed in the gas flow path portion. Numeral 92 indicates sutured portions, and vent holes are indicated at 94a, 94b.

Fig. 19 is a perspective view showing a completely deployed state of an air bag according to a further example of the invention in which a joint portion is provided in such a manner as to start from an opening portion, and Fig. 20 is a cross-sectional view of the air bag 10 shown in Fig. 19 taken along the line ~~H—H~~20-20 thereof. A joint portion 101 can be formed by joining parts of upper and lower panels of a gas flow path portion in such a manner as to form a belt-like configuration extending from the opening portion and having a rounded end, whereby two flow paths 104a and 104b can be formed in the gas flow path portion. In this case, the opening of the air bag is formed into a penetrating configuration which is penetrating into openings 103a and 103b. The gas passes through the openings 103a and 103b and flows into an occupant restraint portion via the flow paths 104a and 104b. In this case, too, however, the number and configuration of gas flow-in portions within a retainer should be made to coincide with those of the openings of the air bag. Numeral 102 indicates sutured portions, and vent holes are indicated at 105a, 105b.

Fig. 21 is a perspective view showing a completely deployed state of an air bag according to another example of the invention in which joint portions are provided, Fig. 22 is a cross-sectional view of the air bag 11 shown in Fig. 21 taken along the line ~~I—I~~22-22 thereof, and Fig. 23 is a cross-sectional view of the air bag 11 shown in Fig. 21 taken along the line ~~J—J~~23-23 thereof. Joint portions 111, 112 and 113 are formed by joining parts of upper and lower panels together at three locations in an air bag deployment direction in a linear fashion. A lower surface of a portion constituting a central flow path 116b is first cut partially away and then is sutured (reference numeral 114 denoting the sutured portion), and therefore the central flow path 116b becomes thinner than flow paths 116a and 116c. On the other hand, joint portion 113

separates another section of the gas flow path portion into two flow paths 117a, 117b. The gas passes through the openings 115a, 115b and 115c and then flows into a occupant restraint portion via the three flow paths 116a, 116b and 116c and then the two flow paths 117a, 117b in the gas flow path portion.

While there is no limitation to the configurations of the joint portions, a circular, oval, square, diamond or linear configuration is preferred since they facilitate the formation of the joint portions.

Both the aforesaid penetrating portions and joint portions may be provided in an air bag.

The penetrating portions and/or joint portions are preferably provided in such a manner that the capacity of air bags becomes constant in varying the sizes of air bags as required for different car types, whereby an inflator having a constant output can be used commonly for different car types.

In addition, in a case where an inflator with a constant output is used, the penetrating portions and/or joint portions are preferably provided in such a size that 0.1 to 0.2 second is required from sensing of a collision of the vehicle by the sensor to deflation of the air bag after it is inflated in a front barrier collision test with a test vehicle running speed of 50 to 55km/h.

Preferably a total of cross-sectional areas of penetrating flow paths is 160cm$^2$ or greater when portions in a gas flow path portion where the penetrating portions and/or joint portions exist are cut in a plane normal to an air bag deployment direction, and more preferably the total becomes 240cm$^2$ or greater. With the total being less than 90cm$^2$, not only is the air bag deployed at slower speed but also an internal pressure applied to the gas flow path portion by the gas becomes so high that there is ~~cauees~~caused a risk of the air bag being exploded.

Thus, while the air bag system according to the invention

has been described heretofore with reference to the appended drawings, the invention is not limited thereto but many modifications can be made thereto without departing from the sprit and scope of the invention.

According to the air bag system of the invention, the capacity of different air bags which are required for different car types can be maintained constant by providing penetrating portions and/or joint portions which are both dimensioned into predetermined sizes. Therefore, the same size inflator can be used commonly on different car types while maintaining the occupant restraining performance of the air bags, whereby the production cost of air bag systems can be reduced. The air bag system of the invention is preferred for use for a front occupant air bag system.

In addition, since the capacity of an air bag can be reduced when compared with a conventional air bag of the same size, an inflator of a smaller output can be adopted, thereby making it possible to make the inflator smaller in size and lighter in weight.